

# Development of the doctoral study programme in “High-Energy Physics and Accelerator Technologies”



CERN Baltic Group

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*on behalf of the CBG Study programme group*

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NATIONAL  
DEVELOPMENT  
PLAN 2020



EUROPEAN UNION  
European Social  
Fund



RIGA TECHNICAL  
UNIVERSITY <sup>[1]</sup>



UNIVERSITY  
OF LATVIA <sup>[2]</sup>

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# Introduction



- Development of joint study programmes is one of the main priorities of the CERN Baltic Group, as evidenced by the Study programme group within CBG;
- Since the inception of the CBG in May 2018, work on a doctoral programme has been on-going;
- The aim of such a programme is to *further the development of a research community in high-energy physics, accelerator technologies and other related fields of research in the Baltic region*;
- With the funding from the European Social Fund the development was accelerated in 2020;
- A part-time administrative staff member employed (S. Vītola) at RTU to work on this task;



- A joint doctoral programme by the leading research universities in Latvia, Riga Technical University (RTU) and the University of Latvia (UL) used as the first step towards the main aim;
- The programme was developed to match successful programmes in the Nordic region:
  - comparison made with Helsingin Yliopisto (FI) and Uppsala Universitet (SE);
- The study programme is to be divided into two main study directions [high-energy] physics and accelerator technologies;
- The curriculum of the programme developed in close collaboration with the CBG partners;
- The development of the programme also involved the participation of industry representatives and existing students;



# Programme Structure



- The study programme is developed to be a **4-year doctoral** degree **programme**;
- During the **first year** the students are expected to cover the **study courses** and obtain all the necessary knowledge needed to successfully carry out their research activities;
- During the **second and third years**, students focus on their research work and spend, at a minimum, between 12 and 24 months on a **long-term attachment (LTA) at CERN**, or other applicable research centre or laboratory;
- During the **fourth year** students **return** to their home institution to finish their research activities and to *write-up* their thesis;



# Programme Structure



- The study courses are developed to maximally cover both the theoretical knowledge needed by the students, but also the knowledge of the use of tools vital for their research;
- The courses are developed to comply with the current requirements of the regulations of both universities and the law of higher education, with a view to be as flexible as possible for amendments in the future;
- To encourage interdisciplinarity, main obligatory course of either of the two study directions is offered as a choice course for the other study direction;



# Study Courses



| Title                                 | Type | ECTS | Inst. | Instructor         | Semester |
|---------------------------------------|------|------|-------|--------------------|----------|
| <u>Particle Physics Theory</u>        | O,M  | 12.0 | RTU   | Yuri Dokshitzer    | 1st/2nd  |
| <u>Accelerator Technologies</u>       | O,M  | 12.0 | RTU   | Toms Torims        | 1st      |
| Particle Detectors                    | O    | 3.0  | RTU   | Kārlis Dreimanis   | 1st      |
| Computing and Programming for Physics | O    | 3.0  | RTU   | Kārlis Dreimanis   | 1st      |
| Statistical Methods in Data Analysis  | O    | 3.0  | UL    | Mārcis Auziņš*     | 2nd      |
| Radiation Safety                      | O    | 1.5  | UL    | Elīna Pajuste      | 2nd      |
| Introduction to Particle Physics      | C    | 3.0  | RTU   | Yuri Dokshitzer*   | 1st      |
| Mathematics for Particle Physics      | C    | 6.0  | UL    | CBG Guest Lecturer | 1st      |
| Relativity and Cosmology              | C    | 6.0  | UL    | CBG Guest Lecturer | 2nd      |
| Particles for Medical Physics         | C    | 6.0  | RTU   | Jurijs Dehtjars    | 1st      |
| Data Science for Physics              | C    | 6.0  | RTU   | Kārlis Dreimanis   | 2nd      |
| Computer Aided Design                 | C    | 4.5  | RTU   | Andris Ratkus      | 2nd      |
| Electronics Lab.                      | C    | 4.5  | RTU   | Māris Tērauds      | 1st      |

O - obligatory; C - choice; M - main;

- Guest lecturers from the CBG will act as instructors for multiple courses, adding the regional, Baltic dimension (responsibilities for the courses remain staff at RTU and UL);

\*- potential further guest lecturer involvement;



# Lecturer availability



- A large pool of already involved or perspective lecturers/instructors is available!

## Local lecturers/instructors

| Lecturer/Instructor   | Institution |
|-----------------------|-------------|
| Yuri Dokshitzer       | RTU         |
| Toms Torims           | RTU         |
| Kārlis Dreimanis      | RTU         |
| Andris Ratkus         | RTU         |
| Jurijs Dehtjars       | RTU         |
| Māris Tērauds         | RTU         |
| Mārcis Auziņš         | UL          |
| Elīna Pajuste         | UL          |
| Guntars Kitenbergs    | UL          |
| Vjačeslavs Kaščejevs  | UL          |
| Anatolijs Šarakovskis | UL          |
| Anatolijs Popovs      | UL          |

## Partner lecturers/instructors

| Lecturer/Instructor   | Institution |
|-----------------------|-------------|
| Aurelijus Rinkevičius | VU, LT      |
| Andrius Juodogalvis   | VU, LT      |
| Brigita Abakevičienė  | KTU, LT     |
| Thomas Gajdosik       | VU, LT      |
| Laur Järv             | UT, EE      |
| Stefan Groote         | UT, EE      |
| Andi Hektor           | NICPB, EE   |
| Maurizio Vretenar     | CERN        |

... to name but a few!

- The courses can be fully covered within Latvia, however, this is an amazing opportunity to begin expanding the programme to a regional level through the participation of guest lecturers!



# Current Status



- The necessary documentation package has been prepared and was **submitted** to the Quality Agency for Higher Education (AIKA) on the **17<sup>th</sup> of May**;
- The agency is required to provide a final verdict [approved or not-approved] within 4 months;
- This will allow us to intake the first cohort of students for the academic year of 2021/22!
- We have **received the first comments** and requests for clarification - **no show stoppers** identified!



# Perspective Students



- Negotiations for state-funded studentships for the next academic year are on-going;
- We have successfully identified six students who will undertake/join this study programme in autumn;
- Five students will start their PhDs next semester:
  - 4 local students and 1 international student;
  - 3 HEP and 2 AT;
- One student will transfer from another faculty within RTU after his first year of HEP PhD (we are grateful for the faculty's help facilitating the study place for student's Y1 studies);



# Expected Trend



- We expect to maintain the intake of students relatively stable over the initial years of the programme:

| Students                  | 2021/22 | 2022/23 | 2023/24 | 2024/25 | 2025/26 |
|---------------------------|---------|---------|---------|---------|---------|
| Admitted                  | 5       | 5       | 5       | 5       | 5       |
| of those foreign students | 1       | 1       | 2       | 2       | 2       |
| Cumulative                | 5       | 10      | 15      | 20      | 20      |
| of those foreign students | 1       | 2       | 4       | 6       | 7       |

- These are, of course, approximate numbers to demonstrate the cumulative figures;
- **Important!** We aim to develop an **equivalent master's level study programme** to alleviate some theoretical content and to provide a stable **pathway towards the doctoral programme!**

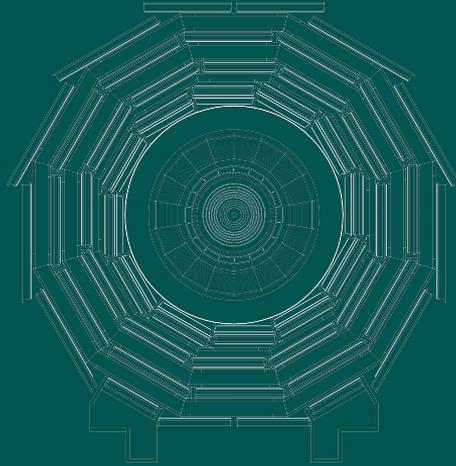


# Summary



- A joint doctoral programme by the leading research universities in Latvia, Riga Technical University (RTU) and the University of Latvia (UL) has been developed as the first step towards a regional study programme!
- The study courses and the programme structure have been established and documentation has been submitted for licensing!
- We expect to have the first official intake of students already in autumn of 2021!
- Potential students have been identified, contacted and even contracted!
- Great boost to the development of HEP and AT research in the region!

[more information can be found [here](#)]



Questions